

Response to Office Action mailed September 15, 2006
U.S. Application No. 10/657,360

REMARKS

Recordation of the terminal disclaimer removing the double patenting rejection and finality of the restriction requirement have been indicated. Claims 13-41 remain in the application.

Claim Rejections

Claim 41

Claim 41 was finally rejected under 35 USC 102(b) as anticipated by Khan, U.S. Patent No. 6059957 ("Khan"). Khan was cited for disclosure of a stabilized light oil product at column 6, lines 46-55 and MPEP 2113 is cited for the principle that the Khan product reasonably appears to be either identical with or slightly different from the claim 41 product. Applicant respectfully traverses because the specification disclosure of the product of a process included in the subject matter of process claim 13 makes it clear that the product of the invention cannot be expected to be even similar to that of Khan, let alone identical or slightly different.

Claim 41 requires that the product claimed be made by the process of claim 13. Claim 13 requires thermal cracking at a process temperature very different from that of Khan. Claim 13 also requires two distinct quenching and stabilizing steps with a temperature limitation of, below 850 degrees F, for the third step.

The thermal cracking step of the claim requires a temperature above 1225 degrees F whereas the art recites the cracking step at about 400 degrees C or about 775 degrees F. See Khan at: column 1, lines 30-31 (describing the prior art); column 4, lines 12-14 (gas is cooled to a temperature appropriate to the operation of the upgrading unit); column 4, line 27 (unit operation at 400-440 degrees C); and Example 1 (425 degrees C cracking).

Khan teaches:

lower cracking temperature;
the use of an oil and water emulsion;

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preferably a surfactant in the emulsion;
apparently no quenching and stabilizing regimes; and
the use of catalyst.

Based on even the most elementary chemical reaction principles, the product of the reaction cannot be expected to be even similar (let alone identical) to that of Khan, even if identical heavy oil feeds were to be used. These differences are supported by the simulated results of certain embodiments of the PCU process at pages 24-29; the Examples data of Tables 6, 7, and 8 which show no coke production (Table 7, column 2); improved liquid properties; and reduced production of light gases compared to those expected in the prior art. See especially the discussion at paragraph [0087].

Certainly the reaction product without quenching at about 775 degrees F as in Khan cannot be expected to produce the same hydrocarbon and related products mixture as the invention of claim 13 at 1225 degrees F followed by rapid quenching within 10 seconds. Applicants have demonstrated improved API of the remixed light oil and heavy crude product and production of a reduced amount of light gases. The process steps by which the product is made should be considered when they are expected to impart distinctive characteristics to the final product (MPEP 2113). Reconsideration and withdrawal of the rejection are respectfully requested.

Claims 13-18, 20, 21, 25-27, and 34-40

These claims were finally rejected under 35 USC 103(a) as unpatentable over Chahvekilian et al. U.S. Patent No. 3842138 ("Chahvekilian") in view of Khan and Gomi U. S. Patent No. 3689401 ("Gomi"). The Office Action rebuts Applicant's previous response because Chahvekilian shows heavy oil upgrading and because nonobviousness cannot be shown by attacking references individually where the rejection is based on a combination. Applicant traverses because the skilled artisan would not be led to apply the process conditions of light hydrocarbon cracking to heavy oil upgrading with a hydrogen-containing stream, and because Gomi does not show a

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post-cracking stabilization step. Also, even considered together, the references do not teach or suggest the invention of these claims.

The primary reference Chahvekilian does not upgrade heavy oil and uses steam cracking with a lighter feed. The skilled artisan would not be led to use the Chahvekilian process with the heavy oils of Khan because such heavy oil processes were conducted at lower temperatures and there was no indication of how to conduct the process at higher temperature so as to upgrade the oil. Also, there was no indication of how to incorporate a hydrogen-containing stream into the steam cracking process of Chahvekilian, certainly a dangerous proposition.

Even though Khan shows a heavy oil upgrade process, there is nothing in any of the cited references teaching a high temperature upgrading followed by quenching with a quench oil, and stabilizing the quenched product below 850 degrees F for 1 to 60 minutes. The stabilizing of Gomi is with an organic sulfur treatment to stabilize aromatics and this would not teach or suggest to the skilled artisan how to stabilize the quench oil/light oil product as per claim 13.

The primary reference Chahvekilian does not disclose upgrading a heavy oil with a hydrogen-containing stream but rather discloses a cracking process for hydrocarbons typical of those downstream from the heavy API materials of this invention. Nothing suggests applying the heavy oil upgrade of Khan to the higher temperature process of Chahvekilian, *contrary to the explicit teaching of Khan to operate at lower temperatures*. Furthermore, no apparatus or device is disclosed, in either reference, for contacting thermally cracked oil product with the quench oil in a manner that permits quenching and stabilization as required by independent claim 13. Accordingly, the proposed application of Khan's heavy oil process to Chahvekilian's process would not result in the claimed invention, especially since the gas recycle does not suggest use of a quench oil. The skilled artisan applying Khan would at best be led to recycle light gases back to quench Chahvekilian's process, not use a quench oil.

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Application of the thermal stabilization of Gomi does not complete the present invention. While the temperatures of Gomi are within the ambit of claim 13 stabilizing temperatures, Gomi uses organic sulfur and a catalyst to stabilize a heavy oil by-product stream **prior** to hydrorefining and eventual olefin reaction. Accordingly, the stabilizing treatment of Gomi adds the organic sulfur compound prior to hydrorefining the heavy oil and the product thereof is changed because of this addition. Gomi does not teach stabilization after hydrorefining the heavy oil and the skilled artisan is not led to do so. No stabilization after cracking, then quenching, is taught.

Since independent claim 13 is distinguished over the combination of three references, the remaining claims dependent thereon are also allowable.
Reconsideration and withdrawal of the rejection are respectfully requested.

Claims 22, 23, 32, and 33

These claims were rejected as above and further in view of Gregoli et al. U.S. Patent No. 6016868 ("Gregoli"). Gregoli is cited for disclosure of a product containing 1.12 wt. % C1- C4 hydrocarbons. Applicant acknowledges that Gregoli discloses removing low carbon hydrocarbons and other undesirable gases from a raw crude, but traverses because the skilled artisan would not apply this technology to the process of the other three references combined. Even if, *arguendo*, the Gregoli separation was applied, there is no certainty that the process of the combined references would not produce high levels of gases without the quench oil and stabilization set forth in independent claim 13. That is, even if gases are taken "off the top", there is no indication to the skilled artisan that more won't be produced; or if produced, how to minimize such production. Only the claimed invention teaches that.

Regarding claims 32-33, see the specification at paragraph [0054]. While Gregoli recognized a hydrogen concentration/pressure technique for improving product quality, there is nothing in Gregoli to suggest applying a technique successful in a hydrovisbreaking operation to produce syncrude, to a heavy oil upgrade. Applicant has shown the ability to improve product quality (no coke) and reduce gases with the

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necessary amount of hydrogen-containing gas by appropriate quenching and stabilizing. That is, the process of Gregoli would at best be supplemental to the invention and the references would still lack the teaching of high temperature cracking followed by oil quench, as discussed above. Reconsideration and withdrawal of the rejection are respectfully requested.

Claims 19 and 29-31

These claims were rejected as above, over three references and further in view of Benham for its disclosure of coke reduction/elimination by increased heavy gas oil recycling. Applicant acknowledges that Benham discloses a coke reduction technique by increasing recycle to permit slightly higher operating temperature, but Applicant traverses because the primary references still fail to combine to teach the invention. Benham does not supply the missing teaching or suggestion to use a quench oil for a high temperature cracking of heavy oil, followed by stabilization. While the Benham teaching might be used to supplement the process of the invention, there is no suggestion in any of the four references to operate the cracking and quench at the conditions indicated by independent claim 13. Reconsideration and withdrawal of the rejection are respectfully requested.

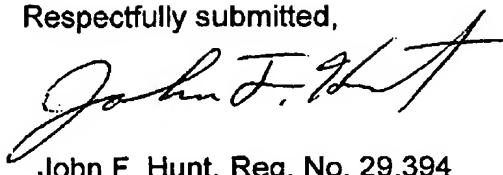
Claim 28

This claim was rejected over the three references as above, further in view of Fuderer U.S. Patent No. 4822521 ("Fuderer"). Applicant acknowledges that Fuderer discloses a syngas production, but traverses because the steps of independent claim 13 are still not taught or suggested, even by the four references. Also, there is no suggestion in Fuderer to apply the methane syngas reformer process to heavy oil cracking, especially since Fuderer is directed to merely syngas production. Certainly, the reference doesn't suggest applying the steam reforming ratio to a heavy oil cracking process with quench oil as set forth in independent claim 13. Reconsideration and withdrawal of the rejection are respectfully requested.

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A notice of allowance is earnestly solicited.

Respectfully submitted,

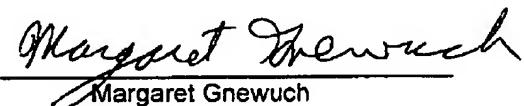


John F. Hunt, Reg. No. 29,394
Attorney for Applicant

ExxonMobil Upstream Research Company
P.O. Box 2189
CORP-URC-SW348
Houston, Texas 77252-2189

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Margaret Gnewuch